Contribution to the knowledge of littoral ascidians (Ascidiacea, Tunicata) of the Senegalese coast

Article · January 1990

CITATIONS
14

READS
63

2 authors, including:

Martin Wahl
GEOMAR Helmholtz Centre for Ocean Research Kiel
250 PUBLICATIONS **8,004** CITATIONS

SEE PROFILE

Bulletin de l'I.F.A.N.
T. 46, sér. A, n[os] 3-4, 1986-1987.

Contribution to the knowledge of littoral ascidians (Ascidiacea, Tunicata) of the Senegalese coast

by FRANÇOISE LAFARGUE (1) and MARTIN WAHL (2)

ABSTRACT

Forty-four species of ascidians have been collected by SCUBA-diving in the region of Dakar (Senegal). The affinities of this population are diverse : several species are autochthonous, others may also be found on European coasts, still others show a circumtropical distribution. The phylogenetic relationships within the Didemnid Ascidians are discussed.

KEY WORDS : Ascidians, biogeography, ecology, evolution, Senegal, systematics.

ZUSAMMENFASSUNG

In der Umgebung von Dakar (Senegal) wurden freitauchend 44 Seescheidenarten gesammelt und katalogisiert, sowie ihre biogeographische Verteilung untersucht. Die Zugehörigkeit der Populationen ist divers : einige Arten sind einheimisch, andere werden auch an europäischen küsten gefunden, wieder andere sind zirkumtropisch. Phylogenie und Evolution einer der Familien, der Didemniden, wird kurz besprochen.

(1) Laboratoire Arago, F-66650 Banyuls-sur-Mer, France.
(2) Laboratoire Arago, F-66650 Banyuls-sur-Mer, France, and Abt. Mar. Oekol. Syst., Univ. Kiel, D-23 Kiel, Deutsche Bundesrepublik.

RÉSUMÉ

Contribution à la connaissance des Ascidies littorales (Ascidiacea, Tunicata) de la côte sénégalaise

Quarante-quatre espèces d'Ascidies ont été récoltées en plongée dans la région de Dakar (Sénégal). Les affinités biogéographiques de cette population sont variées. Plusieurs espèces sont endémiques. D'autres existent également sur les côtes d'Europe. D'autres encore ont une distribution circumtropicale. Les relations phylogénétiques des Ascidies Didemnidae sont discutées. La classification des vingt-sept espèces de Didemnidae des côtes de France reflète leur évolution. Les espèces dépourvues de spicules semblent dériver de celles qui en possèdent. Les treize espèces de Didemnidae de la côte du Sénégal présentent les mêmes transformations caractéristiques que celles des espèces des côtes françaises. Cependant, trois différences sont remarquables : 1) il manque *Lissoclinum perforatum* (GIRARD, 1872) et les espèces qui en dérivent; 2) l'espèce tropicale *Didemnum candidum* SAVIGNY, 1816, a été trouvée à Dakar alors qu'elle est absente sur les côtes françaises; 3) le fait le plus remarquable est la présence dans la lignée à thorax droit de *Didemnum obscurum* MONNIOT, 1969, seule espèce du genre connue qui ne subit pas de rotation thoracique.

MOTS-CLÉS : Ascidies, biogéographie, écologie, évolution, Sénégal, systématique.

INTRODUCTION

During an international colloquium on biological diving from May 4 to May 18. 1984, the authors investigated the ascidian fauna of the infralittoral zone near Dakar (Senegal). Previous studies on Westafrican ascidians have been published by PÉRÈS (1948, 1949, 1951, 1953, 1954), DEKEYSER (1961), C. MONNIOT (1969) and F. MONNIOT (1969).

LIST OF STATIONS

1) **Intertidal zone.**

May 13. 1984 : Pointe Senti.

2) **Infralittoral zone.**

May 10. 1984 : Iles des Madeleines (15-20 m).
May 11. 1984 : Inner Almadies (12-18 m); Outer Almadies (25 m).

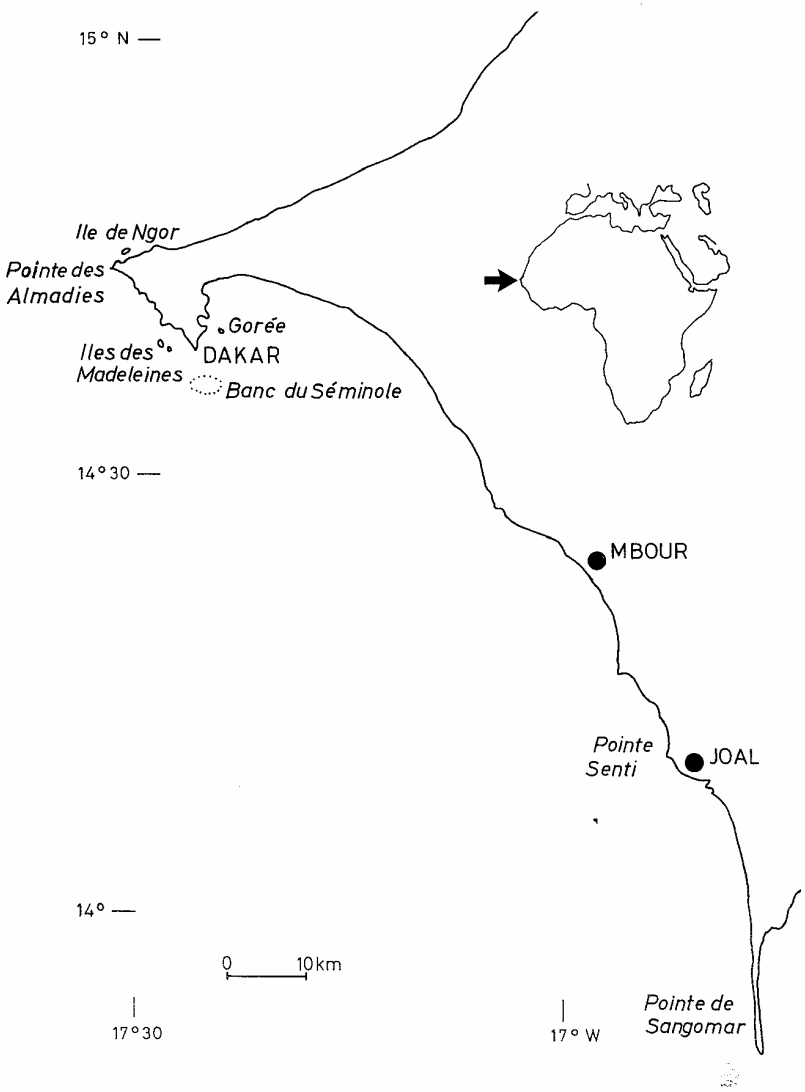

FIG. 1. — Map of stations in Dakar area (Senegal).

May 14. 1984 : Banc du Séminole (25-30 m).
May 15. 1984 : Banc de Mbour (8-12 m).
May 16. 1984 ; Gorée (8-12 m).

LIST OF SPECIES

I) APLOUSOBRANCHIATA

A) Family DIDEMNIDAE VERRIL, 1871.

A1) **Lissoclinum weigelei** LAFARGUE, 1968.

Stations : Pointe Senti, intertidal zone, May 13.
Synonymy : *Lissoclinum weigelei* LAFARGUE, 1968, p. 429.
Description : LAFARGUE, 1975 *b*, p. 292. The specimens of the Senegalese coast were containing larvae.
Ecology : Eurybath species found from the infralittoral fringe to several hundred meters depth.
Distribution : To date the species has been reported from the English Channel, the temperate NE Atlantic, the western Mediterranean and the Senegalese coast.

A2) **Diplosoma listerianum** (MILNE-EDWARDS, 1841).

Stations : Iles des Madeleines, infralittoral zone, 15-20 m, May 10; Inner Almadies, 12-18 m, May 11; Banc de Mbour, 8-12 m, May 15.
Synonymy : *Diplosoma listerianum* LAFARGUE, 1975 *b*, p. 301. The specimens collected on the Senegalese coast were bearing larvae.
Ecology : Infralittoral fringe and infralittoral zone, on all kinds of substrata.
Distribution : English Channel, temperate NE Atlantic, western Mediterranean, Senegalese coast. This species has already been reported for the intertidal zone of the Senegalese coast by F. MONNIOT, 1969, p. 456.

A3) **Diplosoma spongiforme** (GIARD, 1872).

Stations : Outer Almadies, 25 m, May 11.
Synonymy : *Astellum spongiforme* GIARD, 1872, p. 157; *Lissoclinum cupuliferum* KOTT, 1952, p. 79.
Description : LAFARGUE, 1975 *b*, p. 304. This species can be distinguished from the precedent (*D.l.*) by its typical embryonal development. This takes place within the ovary and not in the common tunica as known from the other didemnid species. The specimens collected during this campaign contained larvae.
Ecology : Infra- and circalittoral zones on all hard substrata.
Distribution : English Channel, temperate NE Atlantic, western Mediterranean, Senegalese coast.

A4) **Polysyncraton canetense** (BREMENT, 1913).

Stations : Banc du Séminole, 25-30 m, May 14.
Synonymy : *Diplosomoides canetensis* BREMENT, 1913, p. 4; *Polysyncraton asterix* MONNIOT, 1974, p. 1314; *Polysyncraton canetense* LAFARGUE, 1975 *a*, p. 149.
Description : LAFARGUE, 1975 *b*, p. 149.
Ecology : Infralittoral, circalittoral and bathyal species.
Distribution : In 1913 BREMENT described the distribution of this species for the western Mediteranean. We may now extent it to the Atlantic ocean (Azores and Senegalese coast).

A5) **Polysyncraton lacazei** (GIARD, 1872).

Stations : Inner Almadies, 12-18 m; Outer Almadies, 25 m, May 11.
Synonymy : *Leptoclinum lacazei* GIARD, 1872, p. 153; *Polysyncraton lacazei* LAFARGUE, 1968, p. 398.
Description : LAFARGUE, 1975 *a*, p. 138. The Senegalese colonies are unusually colored : pale pink, more or less amethyst. The regular and dense distribution of spicules within the colony is untypical, too.
Ecology : Infralittoral and circalittoral zone.
Distribution : English Channel, temperate NE Atlantic, western Mediterranean and Senegalese coast (from were it had already been reported by F. MONNIOT, 1969).
Note : the aspect of the colonies is quite different from that of the specimens found on the French coasts (Channel, Atlantic, Mediterranean).

A6) **Polysyncraton bilobatum** LAFARGUE, 1968.

Stations : Banc du Séminole, 27 m, May 14; Banc de Mbour, 8 m, May 15; Inner Almadies, 12 m, May 10.
Synonymy and Description : LAFARGUE, 1968, p. 401; 1975 *a*, p. 134.
Ecology : Infra- and circalittoral species.
Distribution : English Channel, Atlantic ocean, Mediterranean, Senegalese coast.
Note : The color of the Dakar colonies is unusual : they are white instead of the more typical orange-yellow.

A7) **Didemnum candidum** SAVIGNY, 1816.

Stations : Banc de Mbour, 8 m, May 15; Pointe Senti, intertidal, May 13.
Synonymy and Description : LAFARGUE, 1974 *a*, p. 342.
Ecology : all depths (intertidal, infra- and circalittoral, bathyal).
Distribution : Cosmopolite species.

A8) **Didemnum obscurum** MONNIOT, 1969.

Stations : Banc de Mbour, 8 m, May 15.
Synonymy and Description : F. MONNIOT, 1969, p. 453.
Note : the colony surface is quite characteristic : each opening of a branchial siphon is surrounded by a polygonal design. Occasionally, two zooids may be grouped within the same pattern (text-fig. 1).
Ecology : Infralittoral zone.
Distribution : Senegalese coast.

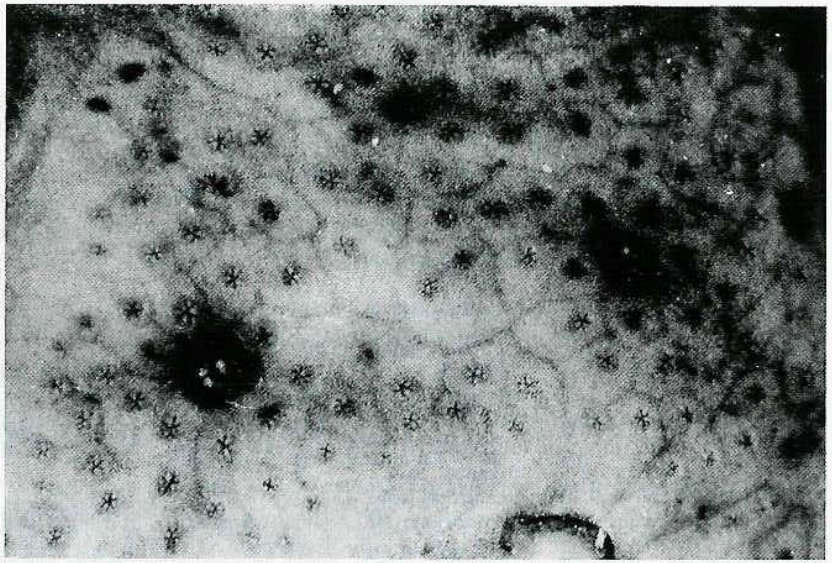

FIG. 2. — View of colonie surface of *Didemnum obscurum* MONNIOT, showing the characteristic polygonal pattern around branchial siphon openings.

A9) **Didemnum maculosum** (MILNE-EDWARDS, 1841).

Stations : Iles des Madeleines, 10 m, May 8; Banc du Séminole, 27 m, May 14, Banc de Mbour, 8 m, May 15; a soft-bodied variety has been collected at the Almadies, 12 m, May 11, and on the Banc du Séminole, 27 m, May 14.

Synonymy and Description : LAFARGUE, 1968, p. 389, by the name of *D. candidum*; LAFARGUE, 1976, p. 260.

Ecology : Infralittoral, circalittoral and bathyal zones.

Distribution : German sea, English Channel, Atlantic ocean, Mediterranean, Senegalese coast.

A10) **Didemnum drachi** LAFARGUE, 1975.

Stations : off Cape Manuel, 38 m (specimen collected by J.-M. KORNPROBST, March 1986).

Synonymy and Description : LAFARGUE, 1975*c*, p. 179. The colonies were containing mature zooids and larvae.

Ecology : Infra- and circalittoral zone.

Distribution : Mediterranean and Westafrican coast.

A11) **Didemnum coniaceum** (VON DRASCHE, 1883).

Stations : Banc de Mbour, 8 m, May 15; Pointe Senti, intertidal, May 13; Iles des Madeleines, 10 m, May 10.

Synonymy and Description : F. MONNIOT, 1969, p. 453, by the name of *D. helgolandicum*; LAFARGUE, 1968, p. 387, by the name of *D. helgolandicum* : LAFARGUE, 1975*c*, p. 188.

Ecology : Intertidal, infra- and circalittoral zones.

Distribution : English Channel, Atlantic ocean, Mediterranean, Senegalese coast.

A12) **Tridemnum cereum** (GIARD, 1872).

Stations : Banc de Mbour, 8 m, May 15.

Synonymy and Description : LAFARGUE, 1968, p. 369; LAFARGUE, 1974*b*, p. 176.

Ecology : Infra- and circalittoral zone.

Distribution : English Channel, Atlantic ocean, Mediterranean, Senegalese coast.

A13) **Tridemnum savignyi** HERDMAN, 1886.

Stations : Banc de Mbour, 8 m, May 15.

Synonymy and Description : F. MONNIOT, 1969, p. 451. The collected specimens contained mature zooids and larvae.

Ecology : Intertidal and infralittoral zones.

Distribution : Cosmopolite species.

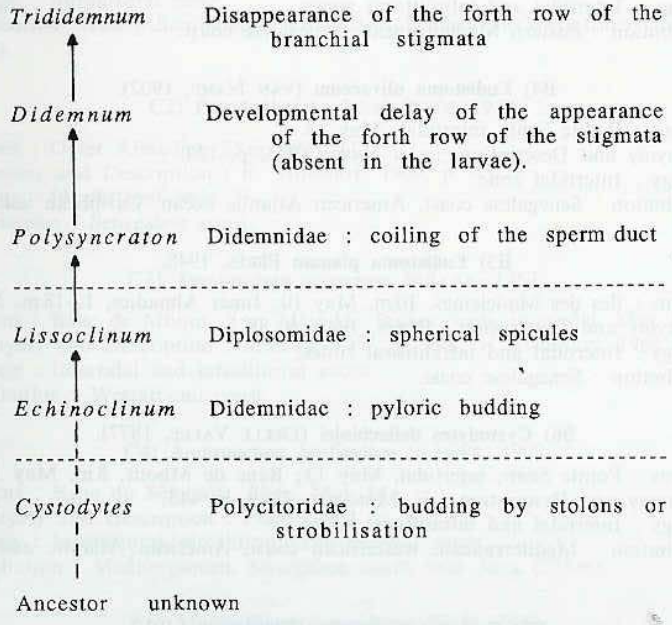

FIG. 3. — Evolution of spicule-bearing Didemnid genera.

B) Family POLYCITORIDAE MICHAELSEN, 1904.

B1) **Clavelina oblonga** HERDMAN, 1880.

Stations : Outer Almadies, 25 m, May 11; Iles des Madeleines, 10 m, May 10.
Synonymy and Description : F. MONNIOT, 1969, p. 451.
Ecology : Infra- and circalittoral zones.
Distribution : African and American Atlantic coasts.

B2) **Clavelina nana** LAHILLE, 1890.

Stations : Iles des Madeleines, 10 m, May 10.
Synonymy and Description : LAHILLE, 1890, p. 185.
Ecology : Infra- and circalittoral zones.
Distribution : Mediterranean, Senegalese coast.

B3) **Polycitor cristallinus** RENIER, 1804.

Stations : Pointe Senti, intertidal, May 11; Iles des Madeleines, 10 m, May 10.
Synonymy and Description : LAHILLE, 1890, p. 151.
Ecology : Intertidal and infralittoral zones.
Distribution : Eastern Mediterranean, Senegalese coast.

B4) **Eudistoma olivaceum** (VAN NAME, 1902).

Stations : Pointe Senti, intertidal, May 13.
Synonymy and Description : VAN NAME, 1945, p. 120.
Ecology : Intertidal zone.
Distribution : Senegalese coast, American Atlantic ocean, Caribbean sea.

B5) **Eudistoma planum** PÉRÈS, 1948.

Stations : Iles des Madeleines, 10 m, May 10; Inner Almadies, 12-18 m, May 11.
Synonymy and Description : PÉRÈS, 1948, p. 88.
Ecology : Intertidal and infralittoral zones.
Distribution : Senegalese coast.

B6) **Cystodytes dellechiajei** (DELLE VALLE, 1877).

Stations : Pointe Senti, intertidal, May 13; Banc de Mbour, 8 m, May 15.
Synonymy and Description : F. MONNIOT, 1969, p. 445.
Ecology : Intertidal and infralittoral zones.
Distribution : Mediterranean, westafrican coast, American Atlantic and Pacific coasts.

B7) **Cystodytes roseolus** HARTMEYER, 1912.

Stations : Banc de Mbour, 8 m, May 15 : Pointe Senti, intertidal, May 13.
Synonymy and Description : F. MONNIOT, 1969, p. 447.
Ecology : Intertidal and infralittoral zones.
Distribution : West- and Southafrican coasts.

B8) **Cystodytes denudatus** PÉRÈS, 1953.

Stations : Banc de Mbour, 8 m, May 15; Pointe Senti, intertidal, May 13.
Synonymy and Description : F. MONNIOT, 1969, p. 445.
Ecology : Intertidal and infralittoral zones.
Distribution : Senegalese coast.

B9) **Cystodytes senegalense** F. MONNIOT, 1969.

Stations : Pointe Senti, intertidal, May 13.
Synonymy and Description : F. MONNIOT, 1969, p. 449.
Ecology : Intertidal and infralittoral zones.
Distribution : Senegalese coast.

C) Family POLYCLINIDAE HARTMEYER, 1908.

C1) **Pseudodistoma cereum** MICHAELSEN, 1924.

Stations : Outer Almadies, 25 m, May 11.
Synonymy and Description : F. MONNIOT, 1969, p. 437.
Ecology : Infralittoral zone.
Distribution : Widely distributed in the southern hemisphere (Westafrican coast, New Zealand).

C2) **Pseudodistoma breni** PÉRÈS, 1949.

Stations : Outer Almadies, 25 m, May 11.
Synonymy and Description : F. MONNIOT, 1969, p. 437.
Ecology : Infralittoral zone.
Distribution : Senegalese coast.

C3) **Amaroucium accarense** MILLAR, 1953.

Stations : Banc de Mbour, 8 m, May 15; Pointe Senti, intertidal, May 13.
Synonymy and Description : MILLAR, 1953, p. 291; F. MONNIOT, 1969, p. 427.
Ecology : Intertidal and infralittoral zones.
Distribution : Westafrican coast.

C4) **Amaroucium profundum** SLUITER, 1909.

Stations : Banc du Séminole, 27 m, May 14.
Synonymy and Description : PÉRÈS, 1954, p. 15.
Ecology : Infralittoral, circalittoral and bathyal zones.
Distribution : Mediterranean, Senegalese coast, near Java (275 m).

C5) **Macroclinum senegalense** PÉRÈS, 1949.

Stations : Banc de Mbour, 8 m, May 15; Pointe Senti, intertidal, May 13.
Synonymy and Description : F. MONNIOT, 1969, p. 433.
Ecology : Intertidal and infralittoral zones.
Distribution : Senegalese coast.

C6) **Polyclinum aurantium** MILNE-EDWARDS, 1841, var. **joalense** PÉRÈS, 1949.

Stations : Banc de Mbour, 8 m, May 15; Pointe Senti, intertidal, May 13.
Synonymy and Description : F. MONNIOT, 1969, p. 435.
Ecology : Intertidal and infralittoral zones.
Distribution : Westafrican coast.

II) PHLEBOBRANCHIATA

D) Family PEROPHORIDAE GIARD, 1872.

D1) **Ecteinascidia turbinata** HERDMAN, 1886.

Stations : Pointe Senti, intertidal, May, 13.
Synonymy and Description : VAN NAME, 1945, p. 169.
Ecology : Intertidal zone.
Distribution : Senegalese coast, Caribbean sea, Bermuda, South Florida, Bahamas, Jamaica.

D2) **Ecteinascidia conklini** BERRILL, 1932.

Stations : Pointe Senti, intertidal, Mays 13.
Synonymy and Description : VAN NAME, 1945, p. 171.
Ecology : Intertidal zone.
Distribution : Senegalese coast, Caribbean sea, tropical American Atlantic coast.

D3) **Perophora listeri** WIEGMANN, var. **senegalensis** PÉRÈS, 1951.

Stations : Pointe Senti, intertidal, May 13.
Synonymy and Description : PÉRÈS, 1951, p. 1057.
Ecology : Intertidal zone.
Distribution : Mediterranean, Senegalese coast.

III) STOLIDOBRANCHIATA

E) Family STYELIDAE SLUITER, 1895.

E1) **Botrylloides nigrum** HERDMAN, 1886, var. **giganteum** (PÉRÈS, 1949).

Stations : Banc de Mbour, 8 m, May 15; Pointe Senti, infralittoral fringe, May 13.
Synonymy and Description : C. MONNIOT, 1969, p. 628.
Ecology : Intertidal, infra- and circalittoral zones.
Distribution : The species is known from all tropical coasts. The form described by PÉRÈS is common on the Senegalese coast.

E2) **Botrilloides leachi** (SAVIGNY, 1816).

Stations : Pointe Senti, intertidal, May 13.
Synonymy and Description : BERRILL, 1950, p. 224.
Ecology : Intertidal, infra- and circalittoral zones.
Distribution : Cosmopolite species (European, African and Australian coasts).

E3) **Symplegma viride** HERDMAN, 1886.

Stations : Banc de Mbour, 8 m, May 15.
Synonymy and Description : VAN NAME, 1945, p. 232; C. MONNIOT, 1969, p. 630; C. MONNIOT, 1972, p. 620.
Ecology : Infralittoral zone.
Distribution : Cosmopolite species (Bermuda, Puerto-Rico, Jamaica, Florida, Senegalese coast).

E4) **Distomus rudentiformis** (SLUITER, 1915).

Stations : Banc de Mbour, 8 m, May 15.
Synonymy and Description : C. MONNIOT, 1969, p. 630.
Ecology : Infralittoral zone.
Distribution : Senegalese coast.

F) Family PYURIDAE HARTMEYER, 1908

F1) **Pyura squamulosa** (ALDER, 1863).

Stations : Banc de Mbour, 8 m, May 15.
Synonymy and Description : C. MONNIOT, 1965, p. 83.
Ecology : Infralittoral zone.
Distribution : European coasts, Senegalese coast.

F2) **Pyura microcosmus** (SAVIGNY, 1816).

Stations : Iles des Madeleines, 10 m, May 10.
Synonymy and Description : C. MONNIOT, 1965, p. 81.
Ecology : Infra- and circalittoral zones.
Distribution : European Atlantic and Mediterranean coasts, Senegalese coast.

F3) **Pyura dura** (HELLER, 1877).

Stations : Inner Almadies, 12-18 m, May 11.
Synonymy and Description : C. MONNIOT, 1965, p. 86.
Ecology : infra- and circalittoral zones.
Distribution : Mediterranean, Senegalese coast.

F4) **Pyura stolonifera** (HELLER, 1878).

Stations : Iles des Madeleines, 10-16 m, May 10; Inner (12-18 m) and Outer (25 m) Almadies, May 11; Gorée, 17 m, May 16.

Synonymy and Description : C. MONNIOT & BITAR, 1983, p. 83; BOURY-ESNAULT, 1983, p. 247, named *Pyura hupferi.*
Ecology : Infralittoral zone. This ascidian is by far the commonest and biggest of the Dakar region. It reaches an individual diameter of up to 30 cm.
Distribution : Senegalese coast, Maroccan Atlantic coast.

F5) **Pyura** cf. **vittata** (STIMPSON, 1852).

Stations : Banc de Mbour, 8 m, May 15.
Synonymy and Description : VAN NAME, 1945, p. 321.
Ecology : Infra- and circalittoral zones.
Distribution : Atlantic American and African coasts, Jamenese coasts.

F6) **Cratistigma gravellophila** (PÉRÈS, 1955).

Stations : Banc de Mbour, 8 m, May 15.
Synonymy and Description : PÉRÈS, 1955, p. 299 : *Heterostigma gravellophila*; C. & F. MONNIOT, 1961, p. 273 : *Cratostigma gravellophila.*
Ecology : Interstitial ascidian living between infralittoral gravel.
Distribution : Mediterranean, Senegalese coast.

G) Family MOLGULIDAE LACAZE-DUTHIERS, 1877.

G1) **Molgula occulta** KUPFFER, 1875.

Stations : Banc de Mbour, 8 m, May 15.
Synonymy and Description : C. MONNIOT, 1969, p. 648.
Ecology : Infralittoral zone.
Distribution : Species known from the Senegal to the North Cape and the Marmara Sea.

G2) **Molgula helleri** DRASCHE, 1884.

Stations : Banc de Mbour, 8 m, May 15.
Synonymy and Description : C. MONNIOT, 1969, p. 650.
Ecology : Infralittoral zone.
Distribution : Mediterranean, Westafrican coast.

G3) **Molgula occidentalis** TRAUESTEDT, 1882.

Stations : Banc de Mbour, 8 m, May 15.
Synonymy and Description : C. MONNIOT, 1969, p. 647.
Ecology : Infralittoral zone.
Distribution : widely distributed, West Indies, warm American Atlantic coasts, Mediterranean, Senegalese coast.

EVOLUTION OF ASCIDIANS

The origin of Ascidians among Tunicata was discussed by TOKIOKA (1971). Origin of the ascidian tadpole larvae and the main lines of ascidian evolution were treated by MILLAR (1966). Relationships between the families of Ascidians were discussed by PLOUGH (1982). This author defines a number of different lines of evolutionary change as represented by modifications of the branchial sac.

Relationships of families of Aplousobranchiata were illustrated by KOTT (1969). This author describes the major evolutionary trends in the zooids : tendancy towards coloniality and increasing colony organisation, decreasing zooid size, branchial sac reduction, loss of longitudinal vessels, increasing viviparity, drecrease in size of the ovary, increase in size of the egg, fertilization increasingly in oviduct. Within the Didemnid family these trends seem to have reached and extreme (e.g. loss of oviduct).

Relationships within the French coasts species of Didemnid family were proposed by LAFARGUE (1983), LAFARGUE & WAHL (1987). The classification of the 27 species of Didemnidae from the French coasts reflects their evolution. The species lacking calcareous spicules seem to derive from those which possess spicules. For instance, the genus *Diplosoma* " descends " from the genus *Lissoclinum* and the genus *Didemnopsis* from the genus *Tridemnum.* The 22 species with calcareous spicules can be arranged in a linear succession of four genera, representing the probable order in which they appeared in the course of evolution, as follows : *Lissoclinum, Polysyncraton, Didemnum* and *Tridemnum.* As in all highly evolved forms the Didemnid family is quite homogeneous. This evolutionary sequence is characterized by the appearance of attainments that are difficult to assess because they concern gradual rather than abrupt morphological transformations of the male gonad (coiling of the sperm duct), of the alimentary duct (relative lengthening of the terminal gut) and of the filtration system (diappearance of the fourth row of branchial stigmata).

These transformations are interrelated. Their correlating factor might be the concomitant diminution observed in zooid size that can be observed along the same taxonomical axis (from *Lissoclinum* to *Tridemnum*) : as structures such as the gut or the sperm duct cannot be shortened indefinitely without impairing their respective functions of digestion and sperm maturation. They have to curve and form loops (gut) or coil up inside a shrinking abdomen (sperm duct) giving the impression of an increase in length in reality is only relative. The same causes may account for the desappearance of the fourth

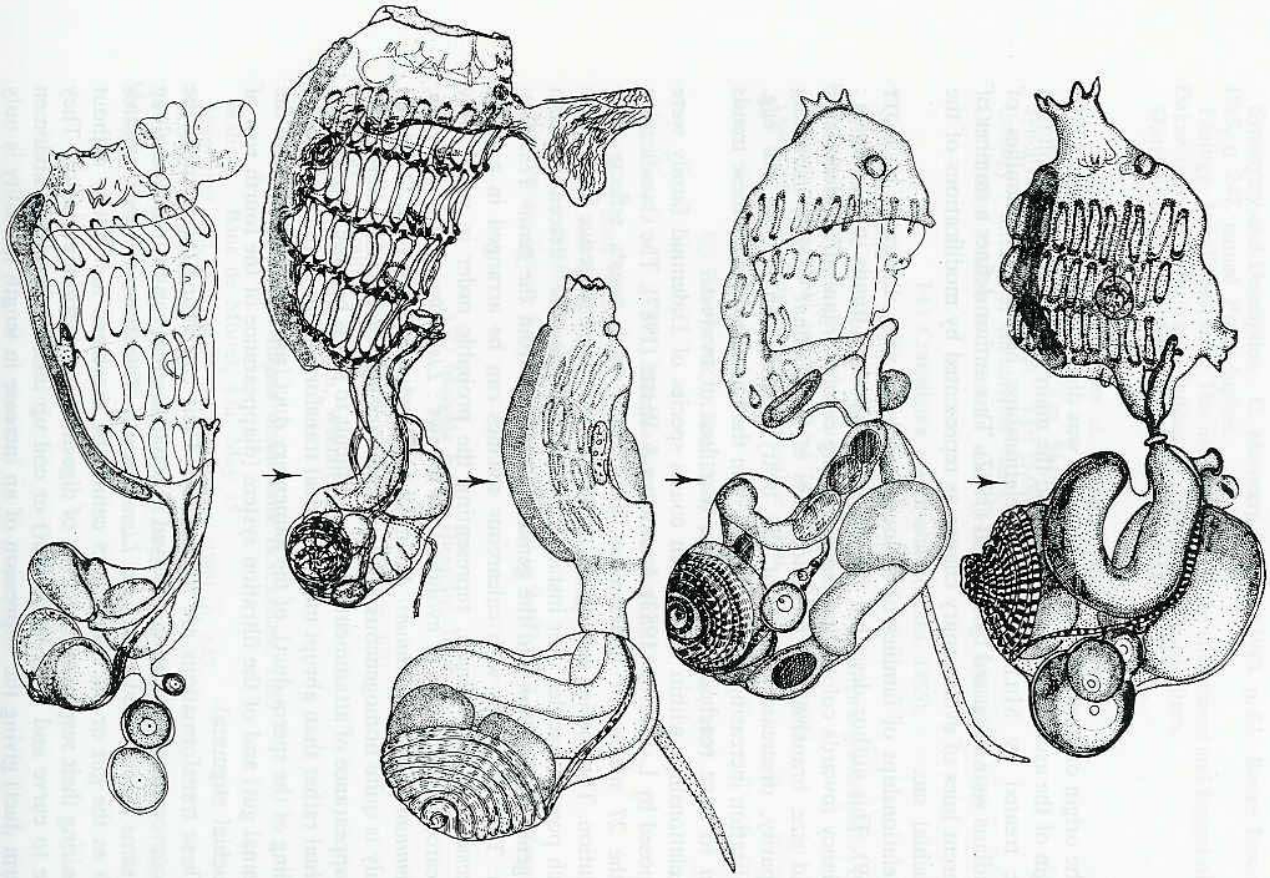

FIG. 4. — Filiation of the principal species characterized by a 180° levogyre rotation of the thorax; from left to right : *Lissoclinum weigelei* LAFARGUE, *Polysyncraton lacazei* (GIARD), *Polysyncraton bilobatum* LAFARGUE, *Didemnum coriaceum* (VON DRASCHE), *Tridemnum cereum* (GIARD).

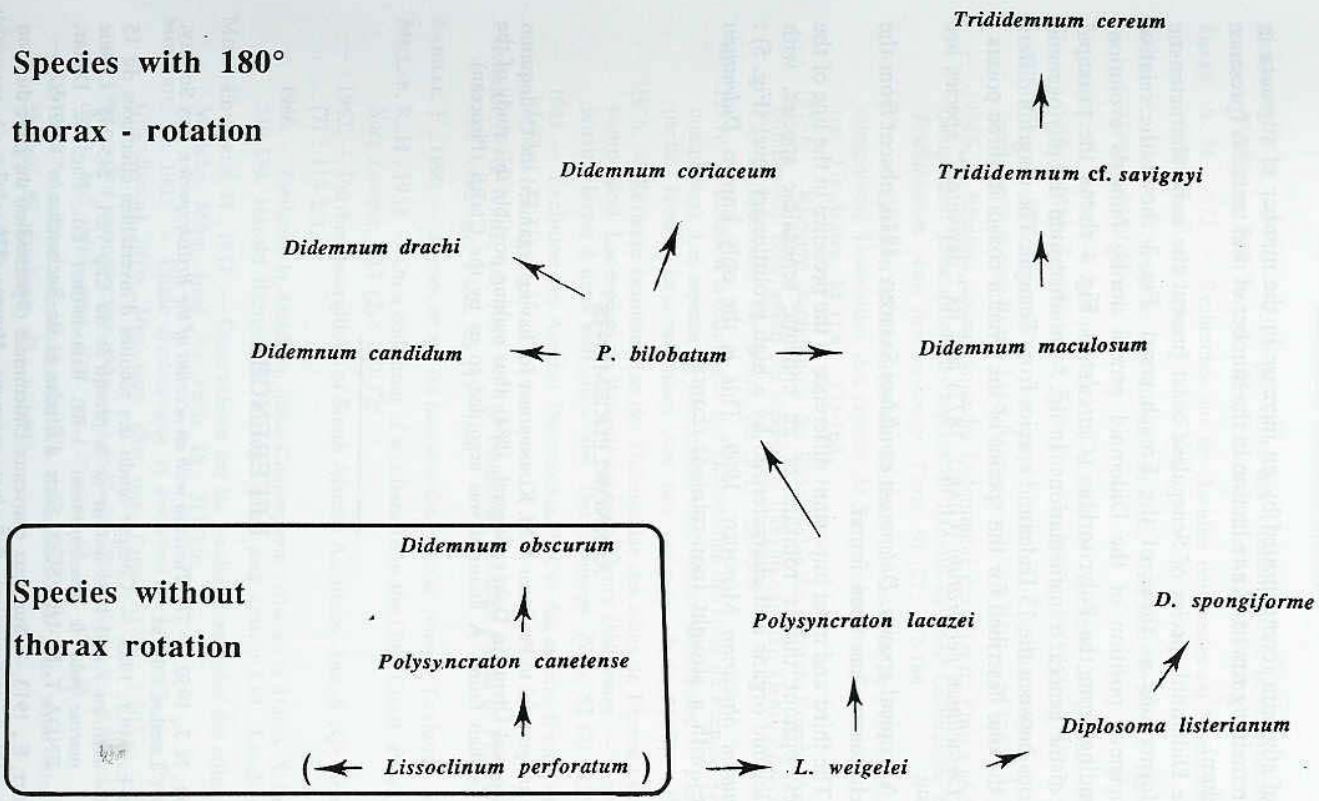

FIG. 5. — Descendance of the 13 Didemnid species from the region of Dakar (Senegal).

row of stigmata (compensated by an increase in the number of stigmata in each remaining row) and a reduction in the number of oral tentacles (presence of velum).

The Didemnid species of Senegalese coast present the same characteristic transformations as those of the French coast. Fig. 3 shows the relative phylogenetic position of the Didemnid genera during family's evolution, descending from the Polycitoridae (*Cystodytes*). Fig. 4 shows the principal steps of the generic transformations. In fig. 5 are illustrated the phylogenetic relations between the 13 Didemnid species from Senegal. The diagram differs from the one described for the species of the French coasts in three points :

1. *Lissoclinum perforatum* (GIARD, 1872) and its "derivated" species are missing.

2. A tropical species, *Didemnum candidum* SAVIGNY, 1816, absent from the French coasts, has been found.

3. The third and most important difference is the presence in the line of the species without thorax rotation of an endemic senegalese species, with spiculogenic organs and characterized by a high evolutionary level (Fig. 5) : *Didemnum obscurum* MONNIOT, 1969. This is the only known *Didemnum* species with a straight (non-rotated) thorax.

ACKNOWLEDGEMENTS

We are grateful to Professor J.-M. KORNPROBST for having organized the Colloquium of Biological Diving in Dakar (Senegal, 1984), thus making possible this study of the local ascidian fauna. A financial was accorded to us by the CNRS (Pirocean).

REFERENCES

BERRILL, N. J., 1950. — *The Tunicata with an account of the British species.* Ray Society, London : 1-134.

BOURY-ESNAULT, 1983. — Compte rendu des récoltes d'invertébrés effectuées du 15 avril au 5 mai 1983 autour de la presqu'île du Cap-Vert : 245-248. *Chimie marine pour le développement.* J.-M. KORNPROBST Ed., Fac. Sc. Dakar, ENDA-T.-M.-UNESCO, Série d'Études et de Recherches n° 83-91-92.

BRÉMENT, E., 1913. — Sur deux nouveaux Didemnides (Synascidies) du golfe du Lion (Note préliminaire). *Bull. Inst. océanogr. Monaco,* **275** : 1-7.

DEKEYSER, P. L., 1961. — Liste provisoire des Urochordés de la côte occidentale d'Afrique. *Bull. Inst. fr. Afrique Noire,* **23** (A1) : 217-230.

GIARD, A. M., 1872. — Recherches sur les Ascidies composées ou Synascidies. — *Archs. Zool. exp. gen.,* **1** : 501-709.

KOTT, P., 1969. — Antarctic Ascidiacea. *Antarctic Research Series 13,* American Geographical Union, 239 p.

LAFARGUE, F., 1968. — Les peuplements sessiles de l'archipel de Glenan. II. Les Didemnidae. Systématique. Écologie. *Vie Milieu,* **19** (2A) : 353-446.

— 1974 *a.* — Description d'un néotype de *Didemnum candidum* Savigny, 1816, espèce-type de mer Rouge (Ascidie composée). *Vie Milieu,* **24** (2A) : 341-356.

— 1974 *b.* — Révision taxonomique des Didemnidae des côtes de France (Ascidies composées). Description des espèces de Banyuls-sur-mer. Généralités. Genre *Tridemnum. Ann. Inst. océanogr. Paris,* **50** (2) : 173-184.

— 1975 *a.* — Révision taxonomique des Didemnidae des côtes de France (Ascidies composées). Description des espèces de Banyuls-sur-mer. Genre *Polysyncraton. Vie Milieu,* **25** (1A) : 133-164.

— 1975 *b.* — Révision taxonomique des Didemnidae des côtes de France (Ascidies composées). Description des espèces de Banyuls-sur-mer. Genre *Lissoclinum.* Genre *Diplosoma. Vie Milieu,* **25** (2A) : 289-309.

— 1975 *c.* — Révision taxonomique des Didemnidae des côtes de France (Ascidies composées). Les espèces de Banyuls-sur-mer. Genre *Didemnum.* — Première partie : larves à trois ventouses. *Ann. Inst. océanogr. Paris,* **51** (2) : 173-194.

— 1976. — Révision taxonomique des Didemnidae des côtes de France (Ascidies composées). Les espèces de Banyuls-sur-mer. Genre *Didemnum.* — Deuxième partie : larves à deux ventouses. *Ann. Inst. océanogr. Paris,* **52** (2) : 259-281.

— 1983. — Évolution des Ascidies Didemnidae. 1. Cas des espèces françaises. *Vie Milieu,* **33** (1) : 1-15.

LAFARGUE, F. & WAHL, M., 1987. — The Didemnid Ascidian Fauna of France. *Ann. Inst. océanogr. Paris,* **63** (1) : 1-46.

LAHILLE, F., 1890. — *Recherche sur les tuniciers des côtes de France.* Toulouse : 1-330.

MILLAR, R. H., 1953. — On a collection of ascidians from the Gold Coast. *Proc. Zool. Soc. London,* **123** (2) : 277-325.

— 1962. — Further descriptions of South African Ascidians. *Ann. S. Afr. Mus.,* **46** (7) : 113-221.

— 1966. — *Evolution in Ascidians. Some Contemporary Studies in Marine Sciences* : 519-534. Harold Barnes, Ed. George Allen and Unwin Ltd., London.

MILNE-EDWARDS, H., 1841. — Observations sur les ascidies composées des côtes de la Manche. *Mém. Acad. Sci. Paris,* **18** : 217-326.

MONNIOT, C., 1965. — Étude systématique et évolutive de la famille des Pyuridae (Ascidiacea). *Mém. Mus. natn. Hist. nat.,* Paris (A) **36** : 1-203.

— 1969. — Sur une collection d'Ascidies de Dakar (Phlébobranches et Stolidobranches). *Bull. Mus. natn. Hist. nat.,* 2e série, **41** (3) : 622-654.

— 1972. — Ascidies stolidobranches des Bermudes. *Bull. Mus. natn. Hist. nat.* 3e série, **57**, Zoologie, **43** : 617-643.

MONNIOT, C. & BITAR, G., 1983. — Sur la présence de *Pyura stolonifera* (Tunicata,

Ascidiacea) à Ras Achaccar (Côte nord Atlantique marocaine). Comparaison anatomique distinctive avec *Pyura praeputialis*. *Bull. Inst. sci. Rabat*, **7** : 83-91.

MONNIOT, C. & MONNIOT, F., 1961. — Recherches sur les Ascidies interstitielles des gravelles à Amphioxus (2e note). *Vie Milieu*, **12** (2) : 269-283.

MONNIOT, F., 1969. — Sur une collection d'Ascidies composées de Dakar. *Bull. Mus. natn. Hist. nat.*, 2e série, **41** (2) : 426-457.

— 1974. — Ascidies littorales et bathyales récoltées au cours de la campagne Biaçores : Aplousobranches. *Bull. Mus. natn. Hist. nat.*, Paris, 3e série, **251**, Zoologie, **173** : 1287-1325.

PÉRÈS, J. M., 1948. — Sur une collection d'Ascidies de la zone intercotidale de Dakar. *Bull. Mus. natn. Hist. nat.*, 2e sér., **20** (1) : 87-95.

— 1949. — Contribution à l'étude des Ascidies de la côte occidentale d'Afrique. *Bull. Inst. fr. Afrique Noire*, **11** (1-2) : 159-207.

— 1951. — Nouvelle contribution à l'étude des Ascidies de la côte occidentale d'Afrique. *Bull. Inst. fr. Afrique Noire*, **13** (4) : 1051-1071.

— 1953. — Note sur deux Ascidies nouvelles récoltées dans la zone intercotidale du Sénégal. *Bull. Inst. fr. Afrique Noire*, **15** (3) : 1002-1011.

— 1954. — Contribution à l'étude des Ascidies de Tunisie. *Bull. Stat. océanogr. Salammbo*, **49** : 3-21.

— 1955. — Sur une Ascidie nouvelle récoltée dans la gravelle de Castiglione (*Heterostigma gravellophila* nov. sp.). *Bull. St. Aquic. Pêch. Castiglione*, N.S., **7** : 299-303.

PLOUGH, H., 1982. — *Sea squirts of the Atlantic continental shelf from Maine to Texas*. The Johns Hopkins University Press Baltimore, Maryland, London, 118 p.

TOKIOKA, T., 1971. — Phylogenetic speculation of the Tunicata. *Publ. Seto mar. Biol. Lab.*, **19** (1) : 43-63.

VAN NAME, W. G., 1945. — The North and South American Ascidians. *Bull. Am. Mus. nat. Hist.*, **84** : 1-476.